Business Sustainability: Tools for a Better Future

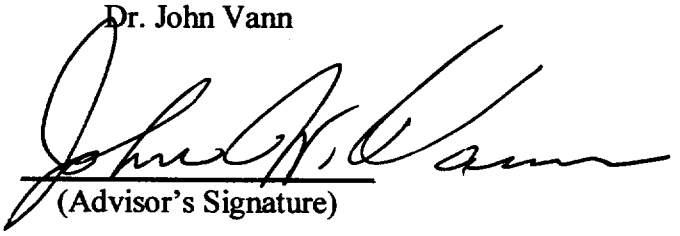
An Honors Thesis (HONORS 499)

by

Matthew E. Osborne

Thesis Advisor

Dr. John Vann



(Advisor's Signature)

Ball State University

Muncie, Indiana

June, 2002

Expected Date of Graduation: May 4, 2002

Acknowledgements

Many, many thanks to Professor John Vann for serving as my thesis advisor. His patience with me has been outstanding and appreciated. He set me on a proper course for my research for this paper that has led to much personal learning, and opened new areas of interest to me. I have enjoyed participating in his class and have been inspired by his enthusiasm for all things sustainable. This project and Dr. Vann's class have filled a gap in the business curriculum for me. Also, thanks to Professor Gwendolen White for lending me her materials for an *extended* period of time. Last, but by no means least, thanks to my diligent editors, Janice Osborne, Eric Shields, and Katherine Dunagan,

Abstract

The beginning of the 21st century has brought society to a crossroads. For the past several centuries, companies have operated under the theme of "business as usual" as they have not only contributed unparalleled prosperity to society, but also waste, pollution and degradation of the natural environment. So what will this turning point in the road bring? One path is the continuation of the status quo, eventually culminating in the demise of the Earth's living systems. The other path is that of change, rethinking how business goes about its activities of creating products or services, and turning business processes into renewing, sustainable activities that have zero impact upon the Earth and its inhabitants.

To that end, business is the responsible agent for achieving the goal of cutting waste, reducing resource consumption, and replenishing the natural environment. To begin to reach these goals, business must accurately account for the activities that have a negative environmental impact. At the same time, business should be concerned with the broader social well-being of its employees, community, and the global population. This requires a measurement and reporting process that adequately incorporates all relevant environmental and social-impact activities for which business is responsible. This paper presents several existing frameworks for business to use that bring environmental and social impacts to light and report them to diverse stakeholders. By using these frameworks, business will ultimately become accountable for the negative impact it can have on the Earth and its inhabitants, and may also contribute to a better future for those that will follow us.

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Introduction

The Roots of Industrialism

The Industrial Revolution ignited in 1709 in England when coke, a high-carbon material, was first used to heat iron ore (Encyclopedia.com 2002). Molten iron could then be formed into numerous iron products. This was paralleled by other rapid technological developments, such as the use of steam engines in mills and transportation, more efficient production methods in the textiles industry, and more chemical solvents used in manufacturing activities (Ibid.). The industrial revolution led to great social change as urban centers sprang up around industry, and governing structures were altered permanently as wealth became less centralized in the hands of noblemen. The mass production of goods established during the Industrial Revolution has directed the course of human history for good as well as ill these last three hundred years. Today, on the precipice of the 21st century, no place or person on Earth is unaffected by the revolution that occurred just three centuries ago.

Little could those inventors and industrialists of the 18th century have known that their relatives in the 21st century would find themselves in a troubling predicament as a result of their discoveries and inventions. The Earth and its residents are facing an assault of unprecedented proportion as a result of the dark side of the Industrial Revolution. Industrial systems by design have not only been in the business of producing goods for customers, but also in the business of producing harmful waste, depleting natural resources, and exploiting human labor. In the United States in 1999 over 7.5 billion pounds of toxic chemicals were reportedly released into the ground, water, and air as a result of industrial processes (EPA Toxic Release Inventory 1999). As a result of misguided industrial systems, the Earth is being overwhelmed with pollutants and

waste that are clogging the life-giving system of support which has sustained life on the planet for billions of years.

Enhanced Profits for Business Through Social and Environmental Responsibility

This paper addresses the current state of industrialism by focusing how today's managers can change the course that has been followed for the last three hundred years to create a new industrialism that indicts production waste and pollution as unacceptable, and finds worker mistreatment intolerable. This is based on a common sense approach asserting that where resources are not fully employed, revenues are not optimally enhanced, and when workers are placed in degrading working environments, the costs to business will be high. In today's business environment, this type of thinking has several names: "eco-efficiency" and "sustainable production" are among the most popular (Pawar and Risseto 2001). As companies become more aware of their social responsibilities, there is a growing realization that environmental stewardship and healthy profits are not mutually exclusive (Olson 2000).

Imposing environmentally-sound practices on business has become a highly contentious undertaking, as seen in the massive lobbying efforts that occur whenever Congress creates new environmental laws. Many national governments have made it a priority for industries conducting business within their borders to achieve sustainable systems of production as soon as possible (Hanson and Mowen 2000). However, the command-and-control approach to environmental regulation is being replaced with market-based alternatives (Beloff, Heller and Shields 1997), as well as industry self-regulation resulting from customer demand (Garcia-Johnson, Gereffi and Sasser 2001). Because business is responsible for the environmental problems that are challenging the Earth's living systems, it is the entity that can reverse the current deterioration by conducting business with stewardship of the Earth in mind. The

difficulty for business lies in performing activities in a socially-responsible manner, while not damaging profit potential.

There are several ways that introducing environmental responsibility into a business can secure profits, while also protecting the Earth. One way to introduce environmental responsibility is through avoidance of environmental liabilities which result when pollutants escape during industrial processes. Another way is through reduced costs associated with more efficient use of resources. A final method is increasing revenue by taking waste products that are generated from production and putting them to use in other activities or selling them to buyers. These profit-enhancing activities can occur when production systems shift from their current materials-process flow, which results in waste byproducts, to a closed-loop system of manufacturing, which cycles waste back into the production process (Ayers 1993). Business must take responsibility to combat waste and pollution production on the path to sustainability.

Environmental cleanup liabilities that result from government regulation can be very costly to business. A U.S. pork processor was fined $12 million in 1997 as a result of violating the Clean Water Act, and more recently a U.S. steel manufacturer was fined $8 million for violating the Clean Water Act (Environmental Data Interactive Exchange 2002). The cost of breaking the law can be devastating to the financial success of a company. While the cost of ignoring the environment is extremely high, the rewards of integrating environmentally-responsible practices into a business are even greater. Since 1975, 3M's Pollution Prevention Pays program has prevented the release of 807,000 tons of pollutants and saved the company $827 million by focusing on four areas: product reformulation, modification of manufacturing processes, equipment redesign, and recycling and reuse of waste (3M Worldwide 2002). While the Clean Air Act was met with scorn by utilities and manufacturers, figures show that it has

resulted in direct cost savings of $6.4 trillion to the U.S. economy (Olson 2000). As seen in these examples, the popular assumption that integrating sustainability into business activities is costly and presents few tangible rewards is misguided.

Environmental Management System Advantages

Integrating sustainable production activities into the business model is the responsibility of top management and covers all functional activities of the business including finance, marketing, engineering, human resources and manufacturing. These functional areas should work cohesively to properly develop an environmental management system. "An environmental management system is a set of management processes and procedures that allow an organization to analyze, control, and reduce the environmental impact of its operations and services to achieve cost savings, greater efficiency and oversight, and streamlined regulatory compliance" (Pawar and Risseto 2001 p10). "A fully-developed environmental management system aids a company in recognizing and exercising its responsibility to solve its own pollution and conservation problems, prevent pollution at the source, develop products with minimal effect on the environment, and conserve natural resources" (Pfeifer 1999 p77). Top management must be involved if an environmental management system is going to work. Those managers involved directly with the environmental management system are responsible for breaking down the "green wall" that exists between environmental professionals and business management (MacLean 2000). This is very important because top management is involved with the creation and implementation of the strategic objectives of the company. If the costs and benefits of implementing corporate sustainability strategy are not properly communicated then not only is the environment going to suffer, but the company will lose out on advantages that result from devoting resources to an environmental management system.

The most opportune time to gain competitive advantage is early in the development of the issue as others are still ignoring or attempting to define the issue for themselves (MacLean September 2001). Adequately defining sustainability for the business in question, as well as understanding the tools needed to transfer those definitions into business value, are integral aspects of gaining top management support (Ibid.). After gaining management acceptance, it is necessary to sell the ideas of sustainability to employees of the company. Employees will be implementing new technologies into the production process and performing oversight functions. They will therefore have the most important role in assuring the success of the environmental system. Developing an environmental management system in a single division is an excellent way to build support for company-wide implementation (Bridges 2002). Success in one division encourages other parts of the company to implement their own management systems to measure environmental performance, enhance decision-making, and provide a foundation for continuous improvement (Ibid.). Management can test the environmental management system in one division in order to see if it creates positive results before taking the risk of firm-wide execution. Environmental management systems can be undertaken with other quality and efficiency reforms being introduced into companies.

The Role of Functional Areas in Sustainable Production

Ultimately, if environmental management systems are going to work properly, they must be undertaken in every functional area of the company. Human resources, engineering, marketing, manufacturing, and finance each have a key role to play in the integration and success of an environmental management system. However, the functions they perform are confined to the strategy objectives that top management establishes for them. These objectives can be as minimal as mere compliance with the law, or as intensive as instituting an environmental cost

measurement system. Sustainable production activities can be integrated into current business models in any industry, and can be a catalyst for competitive advantage over rivals (MacLean January 2001). What should always be kept in mind by management is that sustainable production can leave the realm of socially-responsible management, and move into the area of strategic business activities (Hoffman 2000). Sustainable production adds value to business activities for customers. Focusing more concretely on the functional areas of a business demonstrates how each area holds a key to unlocking the hidden value of environmental and social stewardship.

Human Resources

Human Resources management introduces hidden value into the sustainability equation that can be easily overlooked by management. In an environmental management system, the Human Resources division of a firm is responsible for training employees to perform their job functions in order to minimize waste as well as spot potential problems in the manufacturing process. This process can be demonstrated in the proper handling of a toxic spill cleanup, and by employee suggestions on how the manufacturing process can be refined to reduce waste. Human Resources can promote environmentally conscious behavior by rewarding employees who make suggestions to reduce waste by improving process or by recognizing employees who help avert potential liabilities by preventing contamination of the environment. Promoting environmental responsibility within the organization, the Human Resources division makes a key contribution to achieving strategic environmental goals. Human Resources is also responsible for meeting the social goals of the business by ensuring such things as proper worker training, adequate compensation packages, and creating lines of communication between workers and management.

Engineering

The engineering department of a company has an important role within the manufacturing environment to achieve the company's sustainability goals. Engineering is responsible for product design changes that can reduce the environmental impact of products, as well as making products that can be reused or recycled back into the manufacturing process. For a typical product, 70% of the cost of development, manufacture, and use is determined in its design phase (Minnesota Office of Environmental Assistance 2001). Design for the environment reduces the environmental impact of products and processes, optimizes raw material consumption and energy use, improves waste prevention systems, drives design innovation, lowers costs, and increases product marketability (National Research Council Canada 2002). Design for the environment is a key component of extended producer responsibility for products that is gaining popularity in European countries (Eco-Cycle 2000). Products designed to be quickly disassembled are easier to repair, upgrade, and disassemble for recycling at the end of the product's life. This concept is especially important for products subject to rapid increases in technology that can leave a model obsolete in less than a year (Minnesota Office of Environmental Assistance 2001). Computers, televisions, and motor vehicles, along with other high technology products, are examples of products that can benefit from design for the environment concepts. Integrating modular architecture into these products makes components and materials easier to recover for reuse and recycling (Ibid.). Materials selection is important to the environmental safety of a product as well. There are over 500 chemicals on the toxic release inventory of the EPA, all of which can be considered dangerous to the environment (EPA Toxic Release Inventory 2002). Some materials are more suited to recycling or reuse and should be given priority in the design of products.

Manufacturing

The manufacturing function has a close relationship with engineering in waste minimization and pollution prevention strategies. As the division involved with production activities, manufacturing is responsible for reductions in waste and pollution that can be integrated into the production process. Waste is any material that leaves a process or production and is not a product of that activity (Ciambrone 1996). Waste minimization results from setting goals of waste reduction and altering the manufacturing process until those goals are achieved. Benchmarking is an excellent way to establish waste reduction objectives for a company. Often times waste minimization is a key component of total quality management and just-in-time manufacturing processes, which have become important aspects of manufacturing processes over the last few decades (Ibid.). Closed-loop systems of production are important components of pollution prevention and waste minimization. When a company is responsible for all the pollution it causes, there is greater incentive for it to minimize waste in the production process.

Marketing

The marketing department is broadly concerned with developing customer relationships, product selection and pricing, and product channel networks. Because the marketing division of a company handles the core function of the business, product sales, it plays a key role in developing sustainable practices within the business. In a product-conscious society such as the United States, customers are informed about the environmental practices of a company and often make purchasing decisions based on knowledge of the environmental impact of goods. The discriminating attitude of customers has profound effects on the marketing function of business. A recent RoperASW polling shows that more than half of Americans (53-percent) have purchased a product because the advertising or labeling stated the product was environmentally

safe or biodegradable (2001). Polling also shows that consumers are willing to pay five to ten-percent more for energy-efficient major appliances and computers, pesticide-free fruits and vegetables, biodegradable plastic, and paper products made from recycled materials (Ibid.). This data shows that markets exist for companies that make sustainable production part of their business model. Business should understand that environmentally-conscious consumers are educated, wealthy, and represent a lucrative and large market for green products (Ottman 1993). Eco-labeling is an excellent way to get environmentally friendly products into the hands of consumers. It allows for discrimination between products by informing the customer about sustainable benefits of certain products. Eco-labeling stimulates the market for sustainable products, encourages environmental performance improvement by companies and provides customers with visible evidence of the product's desirability from an environmental perspective (BSDGlobal 2002). When a company adopts sustainable production into the business model, it can capitalize on its new "greenness" by incorporating it into the communications mix of advertising, personal selling, sales promotion, and public relations (Boone and Kurtz 2001).

Product pricing is a key to sustainable production by a business, because too often the market price of a product does not convey the true costs of the purchase (Fuller citing Hawken 1999). Sustainable pricing objectives address the challenge of integrating eco-costs into unit cost structures so that resulting prices better reflect the total costs associated with raw materials converted into finished products (Fuller 1999). Integrating the full cost of a product into the pricing decisions adds incentive to control production waste and pollution within the environmental management system and ultimately, enhances efficiency of production. Including these costs in product pricing also means the company is conscious of the environmental impact of their products and is controlling regulatory burdens by offsetting potential liabilities.

The marketing department's role in the development of the product channel networks is an important part of sustainable production (Fuller 1999). Inherent in the product channel networks is the environmental value of a product. The potential for environmental pollution exists at every point along the channel network. Sustainability along the channel network is a function of channel design for pollution prevention and channel design for resource recovery (Ibid.). Pollution prevention channel design includes minimization of waste resulting from transportation, holding inventory, and production processes (Ibid.). Resource recovery is an area of enormous potential benefit for companies. Reusable packaging systems, remanufacturing, materials recycling, and materials transformation are all strategic areas that business can use to reduce costs and improve consumer profile (Ibid.).

Finance

The functional area of finance is responsible for evaluating costs and benefits associated with sustainable business activities. Cost and benefit measurement is truly the meat of any successful effort to practice sustainable production. The old management mantra applies well: if you can't measure it, you can't manage it. The diverse ways to evaluate environmental and social activities is evident by the many frameworks that exist to measure and report the sustainable activities of business. However, before going into detail about specific frameworks, it is important to understand weaknesses that are present because of the diversity of options. Rarely does a single framework address all of the aspects of sustainability by encompassing the three dimensions of sustainable production: environmental, economic, and social impacts (Ellenbecker and Veleva 2000). Some frameworks use only quantitative measurements, while others use only qualitative measurements (Ibid.). It can be inferred, however, that any measurement is better than no measurement in controlling the unsustainable impact of business.

This paper presents some of the ways that businesses can begin to change the tide of environmental degradation and social deterioration, which has resulted from industrialism, while actively enhancing profits. The major focus of this paper is to present an analysis of current practices available for business to measure and report relevant environmental and social impact variables. To make apparent the many alternatives management has available to develop an effective measurement and reporting mechanism, the remainder of the paper will review many of the frameworks available for business to use. However, the purpose of this paper is not to compare frameworks, but to provide an overview of them.

Frameworks of Sustainability

Indicators of sustainable production can be divided into three distinct frameworks: independent, not-for-profit, and commercial. Integrating sustainable production activities into a business is never free, but these three types of frameworks are alternatives for businesses that have different levels of available resources, including time, money and employees, to commit to developing guidelines for sustainability measurement and reporting. Management will best understand what type of framework will present the best fit for the business and help the business reach its goals for sustainable production. Some businesses may find that an existing framework is good for their structure, while others may try to mix different frameworks or modify a framework to comprehensively address the sustainability of business activities and meet the particular needs of business management.

Sustainability indicators for business are intended to answer the question of how management might know objectively whether a company is moving toward or away from sustainability along its three dimensions (Ellenbecker and Veleva citing Lawrence 2000). Measurement gives management timely feedback on whether sustainability goals are being met.

Because it is easy for management to think only in terms of the 'bottom line', it is important that any framework not have profit and loss as the main foci of the indicator. As discussed previously, gains in profit often result from pollution and waste control initiatives, but profit is not an end in itself. A successful measurement system will focus not only on the quantity of materials and energy sources used, but also the type: renewable versus non-renewable, toxic versus non-toxic (Ellenbecker and Veleva 2000). Priority should also be placed on conservation of energy and natural resources; improved process efficiency is better than material re-use, but re-use is better than recycling (Ibid.). It is also important that any sustainability indicator focus on all environmental impacts of production: how raw materials entering the manufacturing process are extracted or acquired by suppliers, transport methods used to deliver materials and finished goods, and how the product is disposed of, as well as all other activities associated with the product life cycle (Brown 2001). Not to be overlooked are the economic and social measures of sustainability. To meet the standards of sustainable production a business must remain viable financially, and treat workers ethically and equitably.

Independent Frameworks

Independent frameworks for measurement and reporting of environmental and social impacts do not follow a particular set of guidelines created by an outside organization. Rather, they are developed within the business to meet the particular needs of management based on business activities. Independent frameworks can be implemented either in whole or in part based on the desires of management. However, to adequately address the full impact of business activities on sustainable production management should not neglect certain activity measurement and reporting just to avoid negative publicity. Because independent frameworks are not administered nor developed by outside parties, the burden is on management and employees to

accurately measure, record, and report all pertinent environmental and social impact variables. The two independent frameworks presented in this paper are environmental accounting and social accounting.

Environmental Accounting

Environmental accounting is an activity that can be undertaken by an organization within the already existing financial and managerial accounting framework. Environmental accounting is an independent activity undertaken by a company to translate environmental activities into the language of business (Banks, Ditz and Ranganathan 1995). From a managerial accounting perspective, environmental accounting is focused on environmental costs. Environmental costs are incurred to bring environmental quality to a high level or because poor environmental quality may exist (Hanson and Mowen 2000). Environmental costs may directly impact a company's bottom line as a private cost or they may encompass the costs to individuals, society, and the environment, for which the company is not responsible, as an externality or societal cost (Environmental Protection Agency 1995). Environmental accounting is often associated with full cost accounting. Full cost accounting is the allocation of all direct materials, direct labor, manufacturing overhead, sales, general and administrative overhead, and research and development costs to the cost of a product (Hanson and Mowen 2000). If companies integrate the full environmental costs of producing goods and services into the cost structure, prices will begin to reflect the true cost associated with the product or service. This benefits the company as well as society in a market-based economy by providing the information necessary to allocate resources efficiently to environmentally beneficial activities (Rubenstein 1994).

Measurement in a business setting is essentially an accounting function. It is important, however, that environmental accounting and reporting not be confused with traditional

accounting and reporting methods. Traditional accounting is concerned with the flow of cash through a company. Under a traditional accounting system, companies expense the consumption of raw materials through the income statement, while resource saving investments pass through the balance sheet as investments (Hawken, A. Lovins and L.H. Lovins 2000). Environmental accounting is similar to managerial accounting activity, measuring in both monetary units and physical units (Ellenbecker and Veleva citing Baumann and Cowell 2000). Examples are volume and type of emissions, resources used, as well as employee exposures to toxins, releases of pollutants into the environment and fines imposed by government.

An excellent way to begin to integrate environmental accounting activities into a company is to redefine the way activities of a business are accounted for. In a traditional accounting system, assets, liabilities, and expenses are the three account types that let environmental activities pass through without recognizing environmental costs associated with them (Rubenstein 1994). New working definitions are necessary to begin to include environmental activities in these accounts (Ibid.). Natural resource assets should include all of the natural capital value associated with the activities that are performed by the resource in its natural state (Ibid.). Liabilities should absorb the risk associated with the consumption and deterioration of natural capital (Ibid.). Finally, expenses should include the lost value of natural capital consumed in product or service generation (Ibid.).

To account for the flow of natural capital through these various accounts, an understanding of what environmental costs are is necessary. Environmental costs are related to the creation, detection, remediation, and prevention of environmental degradation (Hanson and Mowen 2000). Environmental prevention costs are the costs of activities carried out to prevent the production of contaminants and/or waste that could cause damage to the environment (Ibid.).

Other names for these costs are upfront environmental costs or pollution prevention activities (EPA 1995). These costs include designing of products and processes that are environmentally friendly, employee training to reduce pollution causing activities or for proper pollution cleanup, evaluating suppliers to reduce value chain pollution activities, and development of an environmental management system (Hanson and Mowen 2000). Environmental detection costs are the costs of activities executed to determine if products, processes, and other activities in a company are in compliance with environmental standards (Ibid.). These costs are also called regulatory and voluntary environmental costs (EPA 1995). These costs are generally treated as overhead and are the result of adhering to regulatory laws of the government, voluntary initiatives, or management environmental policy. These costs are the result of conducting environmental audits, monitoring pollution producing activities, and wastewater management activities, among others (Hanson and Mowen 2000).

Environmental internal failure costs are incurred because contaminants and wastes have been produced, but not discharged into the environment (Ibid.). These costs are incurred so that there is no pollution discharge into the environment or to reduce any discharge to acceptable compliance levels (Ibid.). These costs are similar to back-end environmental costs that will predictably occur at some point in the future (EPA 1995). Examples of these costs are treatment and disposal of toxic materials, reclamation of land with underground holding tanks, scrap recycling, and maintenance of pollution control equipment (Hanson and Mowen 2000). These costs are often overlooked so companies can avoid potential liabilities, such as fines, and because they occur frequently, take the appearance of a normal business activity. Environmental external failure costs are incurred after pollution is released into the environment (Ibid.). These costs are

also termed contingent costs because they represent a high probability of expense at some point in the future (EPA 1995).

Occasionally the company realizes external failure costs, but more often they are passed on as societal costs in the form of externalities. Societal costs are seen in the form of higher taxes for remediation and compensation activities, adverse health affects resulting from contamination, decreased property values, and ecosystem degradation, among others. External failure costs are by far the most costly of all environmental costs, often represented in the balance sheet statement as a contingent liability or seen as an extraordinary loss in the income statement. Other environmental costs that are often overlooked are costs associated with corporate image and customer relationships that occur when a company promotes its stewardship and sustainability activities, or is responsible for severe environmental contamination and degradation.

Managers should strive to develop an accurate picture of environmental costs. This can be accomplished by developing an environmental cost report that assigns costs to those environmental cost areas described previously (Hanson and Mowen 2000). These categories should be adequately presented and clearly relate all relevant information concerning environmental costs related to business activities. Due to the fact that environmental costing is related closely to managerial accounting, there is no obligation for a business to publicly disclose environmental costs. However, an environmental financial statement is an excellent way to show commitment to reducing pollution from business activities while demonstrating both the benefits that result from pollution control activities and environmental costs for a defined period (Ibid.). Environmental benefits fall into three distinct categories. Income is the revenue that flows into a company due to environmental actions such as scrap recycling and improved corporate image (Ibid.). Cost avoidance encompasses the ongoing cost savings that were paid in prior years

(Ibid.). Current savings are the reductions in environmental costs accomplished in the current year (Ibid.). Comparison of environmental benefits to environmental costs allows management to assess performance improvement for the current year and progress over past years.

Assigning environmental costs accurately to products or services is an important component of environmental accounting. The environmental impact of a product or service is a function of all environmental costs associated with receiving raw materials, production processes, product or service delivery to customers, and post-purchase factors. This is a short list that attempts to describe the many environmental costs associated with value chain activities, from resource extraction to landfill grave, that are inherent in product creation. These environmental product/service costs can be accounted for in several ways (Hanson and Mowen 2000). Assignment of all environmental costs associated with a product or service, both private and social, indicates full environmental costing (Ibid.). Full private costing assigns only private costs to individual products or services (Ibid.). Assignment of environmental costs can occur in both a functional-based accounting system and activity-based accounting system (Ibid.). Placing environmental cost activities into cost pools allows a functional-based accounting system to assign costs to individual products using unit-level activity drivers (Ibid.). Functional-based environmental cost assignment works best in single product settings (Ibid.). Activity-based costing, on the other hand, works well in single and multi-product settings, tracing environmental costs directly to products that create environmental impacts (Ibid.).

Life-cycle cost assessment can be seen as a culmination of environmental cost assignment activities. Life cycle cost assessment measures the total environmental impact of a product 'from cradle to grave' by assigning costs and benefits to the environmental aspects of a product (Duda and Shaw 1997). Life-cycle assessment has three main objectives (Fuller 1999).

First, it provides a complete picture of the interactions of a process, product, or activity with the environment (Ibid.). It contributes to the understanding of the overall and interdependent nature of the environmental consequences of human activities (Ibid.). Also, it provides decision-makers with information that defines the environmental effects of business activities and identifies opportunities for environmental improvements (Ibid.).

The life-cycle approach combines supplier, manufacturer, and customer viewpoints (Hanson and Mowen 2000). To address these various viewpoints life-cycle assessment consists of four interrelated stages: goal definition, inventory analysis, impact assessment, and improvement analysis (Fuller 1999). Goal determination includes identifying the functional area of study for a business, establishing quality control procedures, and specifying investigation scope (Ibid.). This stage is relevant to increase focus on business activities related to environmental influence (Ibid.). Inventory analysis specifies the types and quantities of material inputs needed, and the resulting environmental releases in the form of emissions, effluents, and solid wastes (Hanson and Mowen 2000). The idea of inventory analysis is dependent on the law of conservation of matter, that energy is neither created nor destroyed, but it may be converted from one form to another (Miller 2001). An inventory analysis should indicate where energy and raw materials are embedded within a finished product or given off as waste output (Fuller 1999). Also included is the recycling potential of the product and resources required for product disposal (Hanson and Mowen 2000). Impact assessment is concerned with the determination of interrelationships among waste and resource depletion, human health, and ecosystem health (Fuller 1999). Among competing product alternatives, impact assessment provides quantitative measures that allow for environmental impact comparison. Based on these relative impacts, a cost assessment can be performed to determine the financial consequences of the environmental

impacts identified in the inventory and improvement steps of the life cycle assessment (Hanson and Mowen 2000). Assessing environmental costs for inventory activities facilitates impact analysis of products (Ibid.). Assigning total environmental cost to a product promotes ranking of the competing alternatives (Ibid.). Improvement analysis deals with the systematic identification, evaluation, and selection of alternatives that will lead to environmental improvements (Fuller 1999). The objective should be to reduce environmental impacts associated with alternatives under consideration, and improve the environmental performance of existing products and processes (Hanson and Mowen 2000).

Environmental accounting aids in decision-making activities that have an environmental impact, allowing a business to reduce environmental costs to the lowest level possible. By focusing on products rather than processes, business has a greater incentive to control for environmental impacts associated with a product because the costs directly affect the price, and therefore competitiveness, of a product. Environmental accounting links every business activity together, including marketing, engineering, and finance, to create products that will eventually have a renewing effect on the environment. Environmental accounting can track important indicators over time, using information generally available but rarely exploited, enhancing a company's knowledge and accountability (Banks, Ditz and Ranganathan 1995). Companies that anticipate the growing need for self-regulation and creating non-polluting processes and products will benefit considerably from an environmental accounting system to bring about the needed change (Ibid.).

Social Accounting

A relatively undeveloped managerial accounting technique is in the area of social accounting. Social accounting places emphasis on the social responsibility that business has to a broad group of stakeholders, including employees, community citizens, and shareholders. Involving social accounting in business decision-making activities is based on the premise that there is a 'social contract' between business and society, with business survival and growth dependent on the delivery of socially desirable ends to society, and equitable distribution of economic, social, or political benefits to groups (Mathews 1993 citing Shocker and Sethi). Social accounting is dependent on moral clarity by a business to act with the best interest of society in mind. Social accounting can take several different forms, but the most relevant to this paper is social responsibility accounting. Social responsibility accounting relates to measurement and disclosure of financial and non-financial data, as well as quantitative and qualitative information about the social activities of a business (Mathews 1993).

Several models have been created to factor social activities into the accounting framework of a business. Objectives for the social accounting framework include identifying and measuring the net social contribution of a business, determining whether the business strategy is consistent with acceptable social priorities and the aspirations of individuals, and providing to social constituents relevant information on business policies, performance and contributions to social goals (Mathews 1993 citing Ramanathan). Social responsibility accounting is accomplished by developing a framework that includes identification of social goals, putting those goals to use in business operations, measuring the social performance of the business, and continuous monitoring of performance (Mathews 1993 citing Brooks). Measurement and reporting of this framework requires tracking business impacts on society, ranking impacts in

order of magnitude, assigning quantitative and qualitative measurements to the impacts, and disclosing the information to the public in an easy to understand format (Ibid.).

Social responsibility reporting is important to legitimizing social accounting activities within a business. A social accounting reporting should include three distinct features (Mathews 1993 citing The UEC). A summarized statement outlining significant aspects of social performance of the company for the past year, including a list of social objectives, is included (Ibid.). This is followed by a social report consisting of quantitative measurements in nine areas including health and safety, education and training, and community benefits (Ibid.). Notes to the social report should explain calculation methods that were used (Ibid.). An employee report is an excellent way to convey information related to employee well-being and actualization. Employees should be permitted to provide input into this report, and the report should include diverse information detailing employee turnover, worker satisfaction, training and education provided, and participation in decision-making (Mathews 1993). Social accounting and reporting is a way for business to demonstrate commitment to societal welfare, and contributes to future viability and growth.

Not-for-Profit Frameworks

Not-for-profit frameworks for measurement and reporting of environmental and social impact variables are established by groups interested in the dissemination of information concerning sustainable practices of business. The groups have developed frameworks that can be adopted independently by a business to achieve the goals of sustainable production. Large multi-national companies support several of these frameworks, but the frameworks can generally be adopted by small and medium sized businesses alike. The framework should meet the needs of management to address all aspects of sustainable production. While the frameworks provide

specific input into measurement and reporting, they are general enough to meet the needs of diverse businesses and broad groups of stakeholders. Several not-for-profit frameworks are reviewed in this paper.

The Global Reporting Initiative

The Global Reporting Initiative (GRI) was launched by the Coalition for Environmentally Responsible Economics (CERES) in partnership with the United Nations Environment Program (Global Reporting Initiative 2002). Its mission is to promote international harmonization in the reporting of relevant and credible corporate environmental, social and economic performance information to enhance responsible decision-making (Ibid.). The GRI has established the *Sustainability Reporting Guidelines* to assist businesses in reporting reliable and relevant information to stakeholders with well-established reporting principles (Global Reporting Initiative 2000). The *Guidelines* promote understanding and comparison with similar reports in a form that provides management with valuable information to enhance internal decision-making (Ibid.). The goal of the GRI *Guidelines* is to create widely accepted indicators among companies and stakeholders to reduce confusion, harmonize rules of disclosure, and maximize the value of reporting (Ibid.). The GRI *Guidelines* do not provide guidance for implementing data collection, information or reporting systems, or organizational procedures for preparing reports (Ibid.). These are left to the discretion of reporting organizations (Ibid.). The GRI *Guidelines* are, however, a tool for decision making at the senior management level, operational level, and communication level (Ibid.). The following paragraphs provide an outline of the GRI *Guidelines* and relate how they assist business in measuring and reporting economic, social and environmental activities.

The GRI *Guidelines* have established principles and practices in five parts: underlying principles, qualitative characteristics, classification of performance-reporting elements, absolute figures and ratios/relative indicators, and disclosure of reporting policies. The underlying principles of GRI reporting are similar in nature to the principles that guide financial accounting practices. The qualitative characteristics make information in GRI reports as useful as possible by enhancing the credibility of the data. The six qualitative characteristics are relevance, reliability, clarity, comparability, timeliness, and verifiability. The classification of performance-reporting elements follows a hierarchy of information with categories at the bottom of the hierarchy, followed by aspects, with actual indicators at the top. Reporters are encouraged to express indicators as ratios to make information easier to interpret and understand. All significant reporting and measurement policies of the reporting entity should be disclosed indicating adherence to the GRI *Guidelines* and the scope of the report, along with other elements (Global Reporting Initiative 2000).

Reporting content required by the GRI *Guidelines* is really the meat of the framework. The first requirement is a statement by the CEO describing key elements of the report. The statement should include highlights of the report content, a declaration of commitment to economic, environmental and social goals, acknowledgement of successes and failures, performance highlights, and major challenges for the organization. A comprehensive profile of the reporting organization and the scope of the report should be included to aid in evaluation of information in subsequent sections. An executive summary overview of the report addresses the need for the reporter to communicate effectively with stakeholders, and allows users of the report to assess performance over time and in comparison to other firms. The vision and strategy of the reporting organization to meet the challenges associated with the economic, environmental, and

social performance of the firm should be expressed. Policies, organizational framework and management systems should be laid out in detail to provide an overview of the governance structure and the system in place to implement the strategy. The final area needed is performance measurement, addressing the organization's economic, environmental and social performance, as well as integrated aspects of the report content. In this section reporters should present quantitative and qualitative data along with relevant objectives and program information. Context should be given to data by providing management explanations, and including information on trends and unusual events. Information should be presented for the current period, at least two previous periods, and a future target period (Ibid.).

Environmental data consists of generally-applicable indicators that are relevant to all organizations, and organization specific indicators that are not relevant to all organizations. Examples of generally-applicable environmental indicators are total energy, materials, or water used. Organization specific environmental indicators would include use of renewable energy, use of recycled materials, or affected water sources. Other environmental indicators fall under the categories of emissions, waste, transport, suppliers, products and services, land-use, and compliance. Economic and social performance indicators are less developed than the environmental indicators. Economic performance indicators should seek to capture the impacts of wealth creation by organizations that are not captured in conventional financial reporting. Major economic performance measures would be investment in human capital, labor productivity levels, community development, and economic impact of products or services (Ibid.).

Social performance indicators indicate the impact of an organizations' activity on society. This includes activity effects on employees, customers and the community, as well as impacts

caused by supply chain activities, business partners and distribution functions. The workplace is a key place to determine social performance. Indicators could include employee contribution in decision-making, cases of workplace injury, health and pension benefits provided to employees, and amount of training dollars in annual budgets. Human rights are key aspects of the social dimension, along with supplier adherence to similar social measures. Integrated performance indicators are at an experimental stage of development. They can be systematic, reflecting linkage between organization level information and information at higher levels, including global measures, or cross-cutting, bridging information across the three elements of sustainability (Ibid.).

Despite the comprehensive indicators offered by the GRI, there are criticisms of its framework. It does not provide a clear, operational definition of sustainability and lacks direction, undermining a drive towards sustainability (Ellenbecker and Veleva citing Hawken and Wackernagel 2000). The requirement of extensive descriptive information about a company and its practices is time consuming and can cover up more important indicator calculations (Ellenbecker and Veleva 2000). There is no guidance provided to select from the over 100 indicator measures provided (Ibid.). Finally, the guidelines have been developed mainly for multi-national corporations and exclude the needs of small and medium-sized companies as well as companies in developing nations (Ibid.).

World Resources Institute

The World Resources Institute was an early pioneer in the quest to develop a measurement and reporting system to adequately communicate corporate environmental performance. The World Resources Institute (WRI) is an environmental think tank that provides objective information and practical proposals for policy and institutional change that will foster

environmentally sound, socially equitable development (World Resources Institute 2002). The 1997 report *Measuring Up* developed a framework to target four areas of environmental performance indicators: material use, energy consumption, nonproduct output, and pollutant releases (World Resources Institute 1997). These performance measures were designed to focus manufacturers, customers, and other stakeholders on products, processes and services that prevent pollution and boost resource efficiency (Ibid.). The four areas of environmental performance are outlined in the following paragraphs along with other requirements of the framework.

Materials use looks at quantities and types of materials used, with indicators tracking resource inputs, distinguishing their composition and source. Energy consumption is concerned with quantities and types of energy used or generated, specifically by fuel types. Nonproduct output deals with quantities and types of waste created before recycling, treatment, or disposal, distinguishing production efficiency from pollution control. Finally, pollutant releases is interested in quantities and types of pollutants released to the air, water and land. This indicator includes toxic chemicals, greenhouse gas emissions, solid waste production, effluent discharge, and other pollutants. Tracking these four indicators compels firms to change products, processes, and practices to prevent pollution and use chemicals, water, energy and other resources more efficiently. By tracking progress and providing focus on improvement the four indicators can be used to construct an excellent environmental management system (World Resources Institute 1997).

Measuring Up provides recommendations to help companies' better measure, manage, and improve environmental performance. Companies should use the environmental performance indicators to benchmark performance against other companies. This activity can be used to

measure the effectiveness of the company's environmental management system. Information systems should be reconfigured to integrate the indicators into internal management reporting systems. Quantitative measures of materials and energy flows in corporate information will help ensure that environmental performance is factored into business decisions throughout the firm. The indicators should be used to manage value chain activities for a company. This ensures that all relevant business activities are addressed and shifts some responsibility for environmental performance onto suppliers, distributors, and retailers. Companies could use the indicators to influence incentive decisions. This would promote the environmental improvement activities of a business by linking them to compensation, motivating employees to improve the environmental performance of the company (Ibid.)

Unlike the Global Reporting Initiative that lays out a specific framework for reporting, *Measuring Up* uses an approach that shows how companies can harness indicators to influence business decisions and provide information to stakeholders, without direct guidance on how to report information. However, in 1998 the WRI introduced the *Greenhouse Gas Protocol* initiative to develop and promote internationally accepted greenhouse gas (GHG) accounting and reporting standards through an open and inclusive process (World Resources Institute 1998). The *GHG Protocol* was developed by a partnership of businesses, NGOs, and governments that have extensive knowledge about accounting and reporting for the six greenhouse gases covered by the Kyoto Protocol (Ibid.). The catalyst for the *Protocol* is the alarming rate of global warming and climate change that is occurring as a result of the release of greenhouse gas emissions into the atmosphere (Ibid.). To insure future viability, companies must engage in self-regulation to limit their production and release of GHG emissions (Ibid.). The *GHG Protocol* provides a framework for measuring and reporting GHG emissions that lowers the time and cost of developing GHG

accounting and reporting, and provides standards that may be developed nationally in the future (Ibid.). The following paragraphs outline the contents of the GHG Protocol.

GHG Protocol accounting principles ensure that the reported information represents an accurate account of an organization's GHG emissions, and that the reported information is credible and unbiased in its treatment and presentation of activities. GHG accounting and reporting are based on the principles of relevance, completeness, consistency, transparency, and accuracy. Relevance is concerned with defining the boundaries that reflect the GHG emissions of the business and understanding the needs of users. Completeness dictates comprehensive accounting for all GHG emissions sources and activities within the chosen organizational and operational boundaries. Consistency allows for meaningful comparison of emissions performance over time. Transparency addresses all relevant issues in a factual and coherent manner, based on a clear audit trail with important assumptions disclosed and appropriate references made to methodologies used. Accuracy is the exercise of due diligence to ensure that GHG calculations have the precision needed for their intended use and provide assurances to the integrity of reported GHG information (World Resources Institute 1998.)

Companies compile a GHG inventory to improve understanding of GHG emissions released as a result of business activities and for multiple other reasons. These reasons fall into four categories: GHG risk management, public reporting/participation in voluntary initiatives, GHG trading markets, and regulatory/government reporting. Companies developing a GHG inventory need information that aids in effective management of risks and opportunities. An inventory of direct GHG emissions occurring upstream and downstream of operations enables assessment of a company's GHG exposure. GHG emissions should be included in any sustainability report that a company releases. The *GHG Protocol* provides information to support

GHG exchange trading and regulatory requirements imposed on a company. Establishing organizational boundaries for emissions measurement is key to providing comprehensive information relating to the activities of the business. Included in this is any control or significant influence the company has over other companies in the form of subsidiaries, suppliers, or partnerships. The *Protocol* has established rules to determine what amount of emissions should be reported when control or significant influence exists. After organizational boundaries have been established the operational boundaries must be defined. Direct and indirect GHG emissions provide scope to operational measurement and reporting. Direct GHG emissions are from sources owned or controlled by the reporting company such as those created during the manufacturing processes. Indirect emissions are the consequence of activities by the reporting company generated by sources owned or controlled by another company, such as emissions from utilities, contract manufacturing, employee traveling, or resulting from product use (Ibid.).

The *GHG Protocol* focuses on GHG accounting and reporting. The goal of such activities is reducing company wide emissions, even when individual facilities, operations or sources increase emissions output. However, with international policies focused on stopping global warming, country based emissions are very important. International companies must be prepared to meet different requirements for several countries to reduce GHG emissions. To meet individual country requirements, the *GHG Protocol* use a bottom-up approach for emissions measurement, calculating emissions at the source and aggregating them to measure facility and corporate levels. Market based emissions reductions should be presented along with operation wide reductions. Successful GHG emissions reductions should be presented in a historical context with performance measured from base year emissions. The base year emissions levels should be adjusted when necessary to maintain comparability if significant structural changes

occur in an organization or transfer of control over emissions sources is recognized. However, the base year measurements should not be adjusted for changes in outsourcing activities, production growth or decline of a company (Ibid.).

Identifying and calculating GHG emissions follows a multi-step approach. As the first step, GHG emissions sources must be identified. GHG emissions generally occur in source categories of stationary combustion, mobile combustion, process emissions, and fugitive emissions. Stationary combustion occurs in fuels from stationary equipment such as incinerators, boilers, and engines. Mobile combustion results from transportation activities such as automobiles and airplanes. Process emissions result from production oriented physical or chemical processes such as smelting activities and are specific to certain industries. Fugitive emissions are either intentional or unintentional releases often occurring during conversion processes or water treatment. Following identification of GHG emissions a calculation approach must be selected to adequately account for emissions production. Direct measurement on a point source of emissions is rare, generally accurate estimates can be found using derived emissions factors. Activity data should be collected and emissions factors selected. This is related to the actual activity level of GHG producing activities, and the related emissions produced per unit level of output. Calculation tools used to estimate GHG emissions should be applied if they adequately meet standards of proper calculation. Two main areas of calculation tools are cross-sector tools that can be applied across the various units found in a company and sector-specific tools that focus on individual activities. The final step of calculating GHG emissions is to step-up emissions data to the company wide level. This data can be aggregated in two ways, individual operations can calculate their own emissions data and report it to the corporate level, or

operational sites can report activity and fuel use data directly to the corporate level where it can then be converted into aggregate emissions levels (Ibid.).

GHG emissions reporting should be concerned with getting the most relevant information possible into the hands of stakeholders in the clearest format possible. A public report should include several items to reach these goals. A description of the reporting organization and boundaries chosen and the reporting period covered is necessary. This should be followed by information on emissions and performance. Supporting information should describe methods to calculate and account for emissions, provide a context for emissions changes, report emissions reductions credits that are used in trading market activities, and other pertinent information. Development of a complete inventory of GHG emissions improves over time, so a report must contain the best data available, concede any limitations, and communicate differences in reporting among various years. Ratio indicators are an excellent way to exhibit performance changes in emissions levels in an easily understandable way that allows for simpler comparisons. Reported GHG emissions data should be verifiable by independent sources outside of the company. Verification determines if the assertions made about the GHG inventory were fairly represented. The company should use verification processes to add credibility to publicly reported information, increase confidence in the reported information by internal company actors, to improve the overall accounting and reporting system, and to meet requirements of market based GHG trading programs (Ibid.).

Global Environmental Management Initiative

The Global Environmental Management Initiative (GEMI) was created in 1990 by the environmental managers of some of the United States' biggest companies with a simple goal in mind: to protect the environment through improved management practices (Environmental

Protection Agency 1995). The GEMI has identified six strategic goals to improve environmental, health and safety performance while achieving economic success and corporate citizenship (Global Environmental Management Initiative 2002). These goals have been enhanced by the release of numerous publications designed to help business improve environmental health and safety activities worldwide (GEMI 2002). Of these many documents two in particular relate well as indices of environmental performance measurement. The *Environmental Self-Assessment Program* (*ESAP*) was developed to give businesses the ability to critically analyze performance and provide the necessary information to plan improvement programs (EPA 1995). The *Total Quality Environmental Management* (*TQEM*) *Primer* improves the overall quality of environment management with a philosophy of continuous environmental improvement (Ibid.). The following paragraphs outline the GEMI *Environmental Self-Assessment Program* as well as the *Total Quality Environmental Management Primer.*

The *Environmental Self-Assessment Program* uses the sixteen Environmental Management Principles of the International Chamber of Commerce Business Charter for Sustainable Development as a benchmark to measure performance. The ICC principles provide a framework for the major aspects of environmental management in four areas: policy setting, systems and procedures, implementation and education, and monitoring and reporting. The *ESAP* works by following several different steps to calculate sustainability performance. The sixteen ICC environmental management principles are divided into sets of elements describing the activities necessary to implement each principle. Each of the elements contains four successively comprehensive performance level descriptions. Respondents determine which performance level description best describes the overall performance of the company or division and score the company against each element on a scale of 0 to 4. Respondents then rate the importance of each

element with a weighting based on the importance of the principle to the sustainability goals of the company. In the basis of assessment column respondents should make note of comments and materials that substantiate their assessment for each element. This provides a basis for future assessments that measure progress. A score is calculated for each principle by multiplying the weighting factor by the element score referred to as the weighted element score. For each principle, the weighted element scores are added together and the result is divided by the sum of all the weighting factors to arrive at a weighted average principle score (Global Environmental Management Initiative 1994).

There are 4 stages of progress to evaluate the steps a company would experience in developing management systems to implement the ICC principles. They focus on the extent to which the environmental management system has been integrated into the business processes of a company. Level one is meeting the requirements of regulatory compliance. This is the minimum level of meeting the mandated requirements of government laws. Level two is systems development and implementation, where formal systems provide compliance methods and facilitate company efforts to reach environmental performance standards extending beyond regulatory compliance. These systems identify environmental investment opportunities that offer the greatest environmental and/or financial returns, considering both costs and benefits. Level three is concerned with successful integration into general business functions. Environmental information and concerns should be incorporated into all relevant business planning activities. Concerns could include direct and indirect environmental impacts of products, operations and services, extending beyond maintaining regulatory compliance. The fourth level is a total quality approach to environmental management with systems application to global operations. Improvements are implemented using leading technologies and management practices. Methods

to continuously improve company knowledge and prevent adverse environmental impacts should be implemented. The full life cycle of products, operations, and services is evaluated in this effort including the effects on the environment. Once the *ESAP* is complete the company can analyze its performance on each element and principle. Benchmarking performance facilitates the ability to prioritize improvement efforts (Ibid.).

The *Total Quality Environmental Management Primer* developed by GEMI is written for corporate environmental managers. *TQEM* is an initiative in the spirit of the total quality management movement that began to take hold in the United States during the 1980's. For that reason *TQEM* has a focus similar to total quality management: understanding customer needs, continuous improvement, doing the job right the first time, and a systems approach to activities. *TQEM* begins by closely examining the current environmental situation of the business. It asks questions about compliance records, degrading activities, opportunities for improved performance, and commitment to environmental improvement. Once current environmental status has been established and objectives set, then the business should implement a plan, do, check, act, and repeat the cycle of continuous improvement. *TQEM* tools should be put to use to aid in data comprehension and to identify underlying causes of pollution creation. A cause and effect diagram provides a qualitative summary of all potential causes of a problem. A Pareto chart is a graphic tool that organizes data to identify and focus on major problems. It takes data on a situation or process, ranks the data in order of the impact on business sustainability, and focuses attention on opportunities to maximize improvement. A control chart is a statistical tool used to determine what amount of variability in a process is inherent and what amount is due to unique events. It defines the expected performance range of a process or system. A flow chart indicates the relationship between process steps that help determine significant deviations from

the ideal process. The chart can use Pareto analysis to define the process and decide where to make changes that will lead to improvement. Benchmarking is the activity of comparing processes to best practice examples. This helps users who can benefit from others' experiences, and comparison provides justification for investment in continuous improvement. Measurement may be either direct or indirect, but it is important to select measures that monitor actual performance. Use of numerical measures and tools improves management oversight and strengthens the credibility of the activity. Ultimately, *TQEM* is based on the premise that 'no matter how good you are, you can always be better' (Global Environmental Management Initiative 1993).

World Business Council for Sustainable Development

"The World Business Council for Sustainable Development (WBCSD) is a coalition of 150 international companies united by a shared commitment to sustainable development following economic growth, ecological balance and social progress" (World Business Council for Sustainable Developemt 2002). The WBCSD has established eight standards that are essential for indicators to achieve the stated goals of an environmental management system. The standards are laid out in the following paragraph.

An indicator must be relevant and meaningful with respect to protecting the environment and human health as well as improving the quality of life. Indicators must inform decision-making and improve the performance of the organization. Good indicators must recognize the inherent diversity of business. Indicators should be consistently followed over time using benchmarking and monitoring techniques. To genuinely inform decision-making, indicators should be clearly defined, measurable, transparent, and verifiable. Any indicator must present understandable and meaningful information to stakeholders. The indicator must be based on the

overall evaluation of a company's operations, products and services, especially focusing on those areas that are under direct management control such as the selection of raw materials and manufacturing processes. Finally, indicators must recognize the relevant and meaningful issues related to upstream (suppliers) and downstream (product usage) aspects of a company's activities (World Business Council for Sustainable Development 2000).

Indicators are divided into two areas for application to business environmental practices. These indicators are addressed in the WBCSD article *Measuring Eco-Efficiency* and are presented in the following paragraphs.

'Generally applicable' indicators are those that can be used by virtually all businesses, although they may present different value for separate companies. For these indicators there must be agreement on how the indicator is related to a global environmental concern or creating business value, its relevance and meaningfulness to all businesses, and the methods used for measurement must be firmly established and definitions widely accepted. 'Business specific' indicators are likely to be individually tailored to a company's needs. These indicators should be useful to management and apply to specific business activities that influence decision-making (World Business Council for Sustainable Development 2000).

Generally applicable indicators have been established and fall under two categories: product/service value and environmental influence in product/service creation. The first value indicator is the quantity of goods/services produced or provided to customers. This indicator can be measured in mass, volume or number and aids in many activities, such as those that deplete natural resources. The next value indicator is net sales of the company. Using net sales as a value indicator presents some problems because production units are not generally linked to sales figures. Environmental influence considers those activities of a business that have a direct impact

on the environment. Energy, water and materials consumption are three measurement areas that have a substantial impact on business sustainability. Greenhouse gas emissions include carbon dioxide, methane, nitrous oxide, and fluorocarbon emissions from fuel combustion, process reactions, and treatment processes. Ozone depleting substances have a global impact and have been systematically banned over the last twenty years by governments. Establishing a "boundary fence" is key to the success of any environmental influence indicator. Two other generally-accepted indicators for business are acidification emissions to air such as sulfur dioxide or ammonia, and total waste produced by a business. Total waste consists of the total amount of substances or objects that will be disposed (Ibid.).

Business specific indicators are applied to the specific measurement approaches of an organization. Examples of value indicators are gross margin and economic value added. Examples of business specific environmental influence indicators are heavy metal emissions to ground and surface water, waste sent to landfill, packaging, chemical oxygen demand to surface water, and greenhouse gas emissions from purchased electricity. Gaining control over these activities is the very essence of becoming a sustainable business. WBCSD worked closely with the World Resource Institute to develop the *Greenhouse Gas Protocol* to measure and report greenhouse gas emissions (Ibid.).

International Organization for Standardization 14000 Series

The International Organization for Standardization (ISO), widely recognized for its 9000 series for quality control management, has developed the 14000 series of international standards on environmental management. The ISO 14000 series is a voluntary program that was first published in 1996 (Rezaee 2000). The series is a computer-based system, aiding in documentation of environmental related activities with a focus on improvement. With twenty-

one designation areas covering diverse topics of environmental management systems, environmental auditing, and environmental labeling, the ISO 14000 series is a tool for companies to more effectively measure environmental sustainability (Ibid.). ISO 14000 falls into six categories focusing on environmental management systems, environmental auditing, environmental labeling, performance evaluation, life-cycle assessment, and environmental aspects in business, with standards related to each category (Ibid.).

ISO 14001 specifies the requirements for an environmental management system and is the only standard in the series that requires certification from an independent third party (Ellenbecker and Veleva 2000). The main goal of ISO 14001 is to require an organization to control and reduce its impact on the environment (Whitelaw 1997). ISO 14001 requires the performance of EMS audits, monitoring and measurement of environmental performance in organizations that focus on continuous improvement, and consideration of environmental aspects related to products and services of an organization (International Organization of Standardization 1998). There are five essential elements of an environmental management system established in ISO 14001 (Pawar and Risseto 2001). The organization should develop a statement of commitment to the environment as part of an environmental policy that is used as a guide for planning and action (Ibid.). The environmental policy, at the very least, should include a statement of the scope of the policy and the associated EMS, a commitment to comply with environmental laws and regulation, a commitment to continual environmental performance improvement, and a commitment to pollution prevention (Bendavid-Val and Cheremisinoff 2001). The environmental policy should be made available to the public to demonstrate company commitment to environmental objectives and promote accountability (Whitelaw 1997). Planning should include a detailed analysis of existing environmental functions, processes and policies,

including any regulatory requirements, to establish clear objectives and targets that are in line with environmental policies (Ibid.). This is where the organization sets a course of action for reducing its environmental impact in specific, measurable ways, such as target reductions in emissions, effluents, and energy consumption (Bendavid-Val and Cheremisinoff 2001). EMS implementation establishes roles, responsibilities and resources, such as training, that should be provided to employees who are involved with the EMS (Ibid.). Communication should be fostered during implementation activities allowing management to convey information about the EMS to workers, and providing opportunities for feedback on environmental concerns and improvement prospects from workers to management (Ibid.). Documentation is a central activity to implementation, allowing for audits of the EMS and promoting control over activities (Whitelaw 1997). Oversight and continuous improvement of the EMS requires a consistent flow of information to monitor key activities and track performance (Ibid.).

A five-step process is used to track environmental performance consisting of measuring specific events, monitoring changes in the measurements, recording all specific findings, evaluating the recorded results, and revising the EMS when necessary (Bendavid-Val and Cheremisinoff 2001). Records should be kept to engage in an annual assessment of EMS performance and value to the company, and ensure compliance and continual performance improvement (Ibid.). Records for environmental performance could include training records, data collection, audit results, EMS revision occurrences, and process and product information, among others (Ibid.). Management should engage in quarterly reviews of the EMS during implementation and annual reviews, at the very least, thereafter (Whitelaw 1997). The reviews should focus on environmental performance, and aid in decision making for continuous improvement activities (Ibid.). Reporting content should follow the elements of these five areas

established in ISO 14001 to fairly present all relevant information that management has used in EMS decision-making activities.

The ISO 14010s are environmental auditing standards for an environmental management system. An environmental audit is a systematic process to obtain, evaluate and report facts concerning conformance with established criteria for environmental management systems (Kuhre 1996). ISO 14010 provides general principles of EMS auditing for clear identification of requirements of environmental auditing such as auditor expectations and audit objectives (Ibid.). ISO 14011 specifically addresses environmental management systems auditing procedures with audit scope identified and preparation of an audit plan (Ibid.). ISO 14012 specifies qualification requirements for those seeking accreditation to become environmental auditors (Ibid.).

ISO 14031 provides general guidelines for environmental performance evaluation in support of ISO 14001 activities. It provides over one hundred environmental indicators that assist companies in evaluating their environmental performance against environmental policies, objectives, targets and other environmental criteria (Ellenbrecker and Veleva 2000). The ISO 14031 framework is outlined in the following paragraph.

There are two general categories of indicators for environmental performance evaluation: environmental performance indicators and environmental condition indicators. Environmental performance indicators are divided into two types. Management performance indicators provide information about management efforts to improve a company's environmental performance. Operational performance indicators provide information concerning the environmental performance of a company. Continuous improvement with the ISO 14031 is a result of the plan-do-check-act management model. This process establishes criteria for selecting environmental performance indicators, collecting data to interpret and report the indicators, and review and

improvement of the evaluation process. ISO 14031 does not mandate the use of any particular indicators, instead it leaves the decision to the company to determine which indicators apply to the activities the company is involved with. Four alternatives for selecting environmental performance evaluation are the cause and effect approach, risk-based approach, life-cycle approach, and regulatory or voluntary initiative approach (Ellenbrecker and Veleva 2000).

Despite the fact that the ISO 14000 series has been available since 1996 in various forms, it still has inadequacies to be a complete tool for sustainability evaluation (Ellenbrecker and Veleva 2000). It does not establish a clear standard of environmental protection and it does not evaluate environmental performance (Ibid.). The goal of the ISO 14000 series to ensure that management is aware of the environmental activities that the company is engaged in, but not with the mandate that they actually need to be improved upon (Ibid.). This means that a company could be a terrible polluter and still be ISO 14001 certified (Ibid.). The standards only address environmental sustainability without a corresponding focus on social or economic sustainability, as found in the Global Reporting Initiative. Finally, the standard provides many examples of environmental indicators, but does not require any specific data collection or evaluative methods for determining relevant information (Ibid.).

Social Venture Network

Social Venture Network (SVN) is a nonprofit network committed to building a sustainable world through business (Social Venture Network 2001). SVN promotes new models and leadership for socially and environmentally sustainable business in the 21st century through initiatives, information services and forums (Ibid.). Social venture network has established a framework of comprehensive standards of corporate social responsibility that include specific indicators of performance. Nine areas of focus, incorporating business ethics, accountability,

governance, financial returns, employment practices, business relationships, products and services, community involvement, and environmental protection, encompass the key practice and measurement areas (Ibid.). An outline of requirements established by the Social Venture Network follows, but for comprehensive implementation the entire framework should be followed.

Social Venture Network ethics practices require companies to create an Ethics committee that includes a mixture of stakeholders to develop and monitor compliance with the ethics statement. Measurement in this area could consist of statistics documenting ethics training and recognition for employees who make difficult ethical decisions. Accountability encourages communication through face-to-face relationships with stakeholders, such as community volunteering and holding forums where open dialogue is encouraged and fostered. Measurement could consist of taking stakeholder surveys regarding satisfaction with disclosure or holding a number of meetings where stakeholders may openly express their views and opinions (Social Venture Network 1999).

The SVN has established twelve governance practices including proper reporting of the company's financial activities and access to management by employees. Compensation for top management based on social and environmental performance activities, and stakeholder satisfaction surveys, are important measures of governance. Financial returns consist of providing investors with fair investment returns, and accurate reporting of financial and non-financial performance targets. Measures of financial return include revenue growth, economic value added, and return on investment, among others. Employment practices should be followed using written policies with objectives to promote diversity and workforce empowerment. Zero tolerance for discrimination should be allowed in hiring, salary, promotion, training, or

termination. Measures of employment practices include number of jobs provided and new jobs created, as well as company reputation as a desirable employer based on employee surveys. Business relationship practices should be established so that business partners are selected based not only on price and quality considerations, but also social, ethical, and environmental performance. Measures of performance consist of volume of business conducted with minority and female owned businesses and percentage of suppliers that are in compliance with SVN standards. Products and services should be produced that increase customer satisfaction and meet or exceed the standards for product safety. Measurement comprises percentage of new product sales, customer satisfaction ratings, product availability, and life-cycle costs of products. Community involvement is enhanced when the community is an important stakeholder in company operations, and the company invests in local economic and social development. Measurement of community involvement includes increases in local employment and business opportunities, and hours spent by company employee's volunteering for community activities. Environmental protection practices should promote the pursuit of sustainable development and create opportunities for efficiency gains in energy and materials usage. An opportunity for the company is to offset carbon emissions with equivalent carbon-fixing activities, such as planting trees. Environmental audits should be performed to verify environmental disclosure reports, and the company should strive towards zero pollution and waste (Ibid.).

A key to successful implementation of the standards is creating a rough sketch of the intended outcome. However, it can be expected that the framework will change dramatically as implementations occurs. This is followed by the engagement phase requiring a final statement of values, goals, and measurements that will be used. The company should focus on incremental steps to achieve the overall framework. This will foster a 'can-do' attitude among employees that

is essential to success. Success is achieved when regular assessments indicate progress towards the established objectives. This is where measurement becomes a requirement for success. A sustainability audit is an excellent way to show that the company is heading in the right direction, and brings new focus to company initiatives (Ibid.).

Commercial Frameworks

Commercial frameworks for measurement and reporting of environmental and social impact variables meet the needs of small and medium-sized businesses that do not have the ability to independently integrate a sustainability framework into the business practice. When finances, time, or personnel limit the ability of a business to address sustainability goals, independent, outside organizations, which work for a fee, provide expert consulting to create a framework that meets the needs of the business without overextending their capacity to perform other business functions. The commercial framework presented in this paper is EcoProfit.

EcoProfit

EcoProfit is a support program for environmental protection and environmental management, created in Austria in 1991 (Cleaner Production Center Austria 2002). EcoProfit is an acronym for ECOlogical Project For Integrated environmental Technology (Ibid.). Started as a cleaner production program, it soon found favor among governments as well as companies. EcoProfit consists of several modules that are implemented in a company over the course of a year (Huchler, Martinuzzi and Obermayr 2000). EcoProfit improves business sustainability practices by interacting with company management as presented in the following paragraph.

Consultants visit the company at the start of the project to identify resource-saving possibilities, which are communicated to management of the company. Workshops are held where the main topics of eco-management are detailed to project coordinators who are

responsible for establishing an environmental policy and environmental program. Participants are supplied with materials that are used to measure environmental performance of the company based on regional conditions. Environmental support teams are established in the companies to implement measures to increase eco-efficiency. Consultants advise the company on legal issues such as safety standards and environmental law. Ultimately, the environmental program is implemented in the company and audits are conducted to identify the affects of the program. The company must receive high marks in several areas to receive the EcoProfit award. A waste-management concept must be in place, internal environmental policy must be established, outcomes must be measured, and the program must be geared to the future. EcoProfit fits very well to the demands of small and medium size enterprises. The main benefits of the program are access to technical experts and content flexibility (Huchler, Martinuzzi and Obermayr 2000).

Conclusions

That sustainability is becoming a core business activity at the beginning of the 21st century is made evident by the diversity of measurement and reporting guidelines that have been presented in this paper. That many businesses still fail to properly understand the importance of environmental and social stewardship in their business practices indicates a neglected opportunity to gain a competitive advantage over business rivals. A 1994 examination of 469 firms listed in the *Forbes 500* indicated that firms classified as high financial performers had higher incidences of environmental policies and/or descriptions of environmental commitment than firms classified as low financial performers (S. Stanwick and P. Stanwick 2000). The ability to choose from among independent, not-for-profit, or commercial guidelines means that businesses are able to develop a measurement and reporting framework that meets their own needs while adequately demonstrating a concern for sustainability. The 'best' framework is the

one that can be adequately integrated into the business model based on resources already present in the business and commitment to the success of the framework.

Currently, many companies are trying to circumvent not only commitments to sustainability, but also regulations that can lead to large penalties from the government. The EPA recently announced that 74 percent of U.S. publicly traded companies fail to properly disclose environmental liabilities in the financial statements as required by the SEC (Sutherland 2002). Instead of freely admitting environmentally and socially negative activities, companies are overtly skirting their duty not only to shareholders, but to broad stakeholders as well. To truly embrace sustainability, companies must acknowledge their polluting pasts and set a course to purge environmentally and socially harmful production activities and products from their business model. It has been proposed that eco-efficiency may not accomplish the task of protecting the Earth and its inhabitants from the perils of industrialism. Instead, companies must become eco-effective, implementing production systems that have zero contiguous impact upon the Earth's living system and designing products that can be 'upcycled', returned to industrial systems with improved, as opposed to degraded, quality (Braungart and McDonough 1998). With eco-effectiveness as the guide, industrial activity is renewing rather than draining (Ibid.). It is very clear that corporations are going to have to start 'thinking outside the box', if the prosperity promised by industrialism will be reached.

Ultimately, measurement and reporting of environmental and social activities by a business is about taking responsibility for the impact that business processes have on the Earth and its inhabitants. However, it is the strategic benefits that come from addressing environmental and social concerns that present great potential advantages to businesses (Brophy and Starkey 1996). Environmental and social reporting allow a company to improve its corporate image and

develop stronger customer relationships. Companies can get ahead of the curve on any potential government regulations that may be enforced and avoid substantial compliance costs. Voluntary reporting by companies may create competition to become the 'most sustainable' company, with recognition given to companies that achieve true and lasting sustainability. Acknowledgement of sustainability successes could be similar to an 'environmental and social' Malcolm Baldrige national quality award. When businesses begin to address the sustainability of their activities in an honest manner, and start to reduce their environmental impact and improve their social performance, it will improve human well-being, benefit the natural environment, and enhance business performance- a true triple bottom line of success.

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